

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, HERMETIC, DIODE, SILICON, RECTIFIER,
SCHOTTKY BARRIER, TYPES 1N6826, 1N6826US, 1N6831 and 1N6831US
JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for silicon, Schottky barrier rectifier diodes. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500, and two levels of product assurance for die (element evaluation).

1.2 Physical dimensions. See figures 1, 2, and 3 (JANC die) dimensions.

1.3 Maximum ratings.

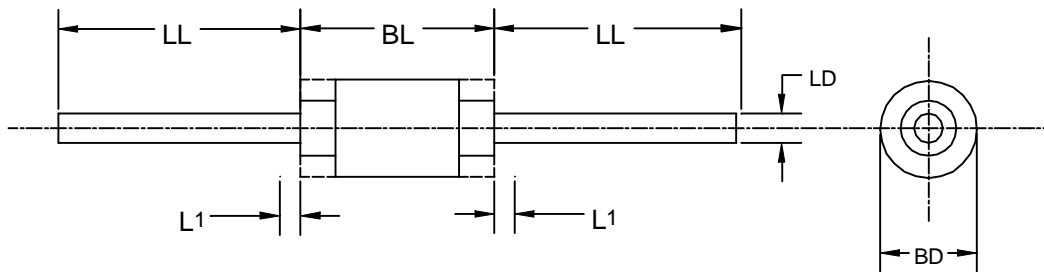
Types	V_{RWM}	I_{O1} (3)	I_{FSM}	T_J & T_{STG}
	<u>V (pk)</u>	<u>A dc</u>	<u>A (pk)</u>	<u>°C</u>
1N6826, 1N6826US	100 (1)	3.0	60	-65°C to 200°C
1N6831, 1N6831US	200 (2)	3.0	60	-65°C to 200°C

- (1) Derate linearly at 4 mA/°C above T_L or $T_{EC} = +150^\circ\text{C}$ where T_L is at $L = 9.52$ mm (.375 inch).
 (2) Derate linearly at 8 mA/°C above T_L or $T_{EC} = +150^\circ\text{C}$ where T_L is at $L = 9.52$ mm (.375 inch).
 (3) Derate linearly at 43 mA/°C above T_L or $T_{EC} = +130^\circ\text{C}$ where T_L is at $L = 9.52$ mm (.375 inch).

1.4 Primary electrical characteristics. Unless otherwise specified, primary electrical characteristics at $T_A = +25^\circ\text{C}$.

Types	Max V_{FM1} I_{FM} = 1.0 A	Max V_{FM2} I_{FM} = 3.0 A	Max I_{RM} @ V_{RWM} pulsed method (see 4.5.1)		Max C_T $V_R = 5$ V dc	Max $R_{\theta JL}$ or $R_{\theta JEC}$ 9.52 mm (3/8 inch) lead length or end cap	Max $Z_{\theta JX}$
			$T_J = +25^\circ\text{C}$ I_{RM1}	$T_J = +125^\circ\text{C}$ I_{RM2}			
	<u>V (pk)</u>	<u>V (pk)</u>	<u>μA</u>	<u>mA</u>	<u>pF</u>	<u>°C/W</u>	<u>°C/W</u>
1N6826	0.76	0.84	5.0	0.25	100	30	3.0
1N6826US	0.76	0.84	5.0	0.25	100	10	3.0
1N6831	0.83	0.92	3.0	0.20	60	30	3.0
1N6831US	0.83	0.92	3.0	0.20	60	10	3.0

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: (Defense Supply Center, Columbus, ATTN: DSCC/VAC, Post Office Box 3990, Columbus, OH 43216-5000), by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

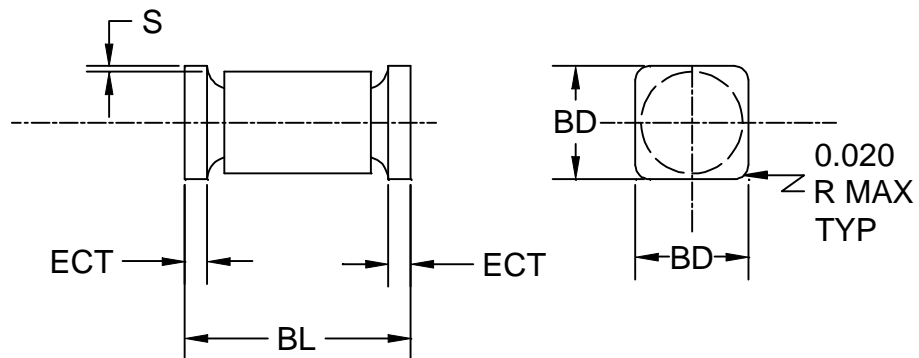


Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
LD	.036	.042	0.91	1.07	
BD	.115	.145	2.92	3.68	3
BL	.130	.195	3.30	4.95	
LL	.900	1.300	22.86	33.02	
L1		.030		0.76	4

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Symbol BD shall be measured at the largest diameter.
4. Lead diameter is not controlled in this zone to allow for flash, lead finish build-up, and mirror irregularities other than heat slugs.

FIGURE 1. Physical dimensions of 1N6826 and 1N6831.

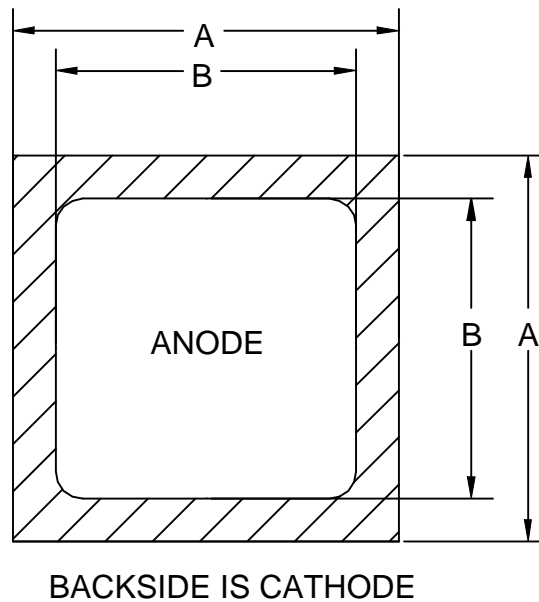


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.200	.225	5.08	5.72
BD	.137	.148	3.48	3.76
ECT	.019	.028	0.48	0.71
S		.003		0.08

NOTES:

1. Dimensions are in Inches.
2. Metric equivalents are given for general information only.

FIGURE 2. Physical dimensions of surface mount family, 1N6826US (D-5B) and 1N6831US (D-5B).



(A-version)

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.058	.062	1.47	1.75
B	.052	.055	1.32	1.40

Design data

Metallization:

Top: (Anode) AL

Back: (Cathode). Ag

AL thickness 25,000 Å minimum.

Ag thickness 30,000 Å minimum.

Chip thickness 0.279 mm (11 mils) \pm .025 (\pm 1 mils).

FIGURE 3. JANC die dimensions.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

STANDARD

DEPARTMENT OF DEFENSE

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (NPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated specifications or specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General. The requirements for acquiring the product described herein shall consist of this document and MIL-PRF-19500.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see 4.2 and 6.3).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

3.4 Interface requirements and physical dimensions. The interface requirements and physical dimensions for the purpose of interchangeability shall be as specified in MIL-PRF-19500 and figures 1, 2, and 3 herein.

3.4.1 Diode construction. These devices shall be constructed utilizing non-cavity double plug construction with high temperature metallurgical bonding between both sides of the silicon die and terminal pins (see MIL-PRF-19500). Metallurgical bond shall be in accordance with the requirements of category II in MIL-PRF-19500. Surface mount devices shall be structurally identical to the non-surface mount devices except for lead terminations.

3.4.2 Lead finish. Lead finish shall be in accordance with MIL-PRF-19500, MIL-STD-750 and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

3.5 Marking. Devices shall be marked as specified in MIL-PRF-19500.

3.5.1 Marking for surface mount (US) devices. Surface mount (US) suffix parts are to be marked with the polarity identification. Initial container package marking will be in accordance with MIL-PRF-19500.

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3 and 1.4.

3.7 Electrical test requirements. The electrical test requirements shall be group A as specified herein.

3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Screening (see 4.3).
- c. Conformance inspection (see 4.4).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500.

4.2.1 Construction verification. Cross sectional photos from three devices shall be submitted in the qualification report.

4.2.2 JANHC and JANKC die devices. Qualification for these devices shall be in accordance with MIL -PRF-19500. This testing may be performed on a TO-5 hermetic metal package in lieu of the axial leaded package.

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4.3 Screening (JAN, JANTX, JANTXV, and JANS levels only). Screening shall be in accordance with table IV of MIL-PRF-19500 and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	Measurement		
	JANS level	JANTX and JANTXV levels	JAN level
3a	Temperature cycling	Temperature cycling	Temperature cycling in accordance with JANTX level MIL-PRF-1900.
3c (1)	Thermal impedance (see 4.5.3)	Thermal impedance (see 4.5.3)	Thermal impedance (see 4.5.3)
9	I_{RM1} and V_{FM2}	Not applicable	Not applicable
10 (2)	1N6826: $T_A = +150^{\circ}\text{C}$; $V_R = 80\text{ V(dc)}$; 1N6831: $T_A = +150^{\circ}\text{C}$; $V_R = 160\text{ V(dc)}$	1N6826: $T_A = +150^{\circ}\text{C}$; $V_R = 80\text{ V(dc)}$; 1N6831: $T_A = +150^{\circ}\text{C}$; $V_R = 160\text{ V(dc)}$	Not applicable
11	$\Delta I_{RM1} \leq 100$ percent of initial reading or 70% I_{RM1} whichever is greater. $\Delta V_{FM2} \leq 50\text{ mV dc}$.	I_{RM1} and V_{FM2}	Not applicable
12	See 4.3.2	See 4.3.2, $t = 48$ hours	Not applicable
13	Subgroup 2 and 3 of table I herein; $\Delta I_{RM1} \leq 100$ percent of initial reading or 70% I_{RM1} whichever is greater; $\Delta V_{FM2} \leq 50\text{ mV dc}$.	Subgroup 2 of table I herein; $\Delta I_{RM1} \leq 100$ percent of initial reading or 70% I_{RM1} whichever is greater; $\Delta V_{FM2} \leq 50\text{ mV dc}$.	Not applicable

- (1) Thermal impedance shall be performed any time after sealing provided temperature cycling is performed in accordance with MIL-PRF-19500, screen 3 prior to this thermal impedance.
- (2) Junction temperature (T_J) is not to exceed $+200^{\circ}\text{C}$ with V_{RWM} . T_J is affected by the device mounting thermal resistance when parasitic power is generated by the temperature dependent leakage current. Until this leakage becomes significant near thermal runaway, T_J remains approximately equal to T_A or T_L for $I_O = 0$.

4.3.1 Screening (JANHHC or JANKC). Screening of die shall be in accordance with MIL-PRF-19500 and as specified herein.

4.3.2 Power burn-in conditions. Burn-in conditions are as follows: T_A = room ambient as defined in the general requirements of MIL-STD-750. Devices may be mounted using any convenient method including the temporary attachment of leads on US suffix devices, provided that the parts are burned-in at $T_J = +150^{\circ}\text{C}$ minimum.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500, table V, and table I herein. Thermal impedance $Z_{\theta JX}$ measurements shall be performed in accordance with MIL-STD-750, method 3101.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in tables VIa (JANS) and VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500 and paragraphs 4.4.2.1 and 4.4.2.2 herein. Electrical measurements (end-points) shall be in accordance with table I, group A, subgroup 2 herein.

4.4.2.1 Group B inspection, table VIa (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
3	4066	$I_{FSM} = 60$ A (pk), condition A 2, $I_O = 3$ A dc; T_A = room ambient as defined in the general requirements of MIL-STD-750 (see 4.5); 5 surges of 8.3 ms each at 1 minute intervals.
4	1036	$I_F = 3.0$ A; T_A = room ambient as defined in the general requirements of MIL-STD-750; $t_{on} = t_{off} = 3$ minutes minimum for 2,000 cycles.
5	1038	$I_F = 3.0$ (min) with I_F adjusted as required to achieve an average lot $T_J = +200^\circ\text{C} +0, -15^\circ\text{C}$. T_A can be adjusted to achieve $T_J = +200^\circ\text{C}$. $f = 50$ -60 Hz, at V_{RWM} (see 1.3).
6	3101	$R_{\theta JL} = 30^\circ\text{C/W}$; $L = 9.52$ mm (.375 inch) lead length (non-surface mount). $R_{\theta JEC} = 10^\circ\text{C/W}$ (surface mount).

4.4.2.2 Group B inspection, table VIb (JAN, JANTX, and JANTXV of MIL-PRF-19500).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
2	4066	$I_{FSM} = 60$ A(pk), condition A 2, $I_O = 3.0$ A; T_A = room ambient as defined in the general requirements of MIL-STD-750 (see 4.5); 5 surges of 8.3 ms each at 1 minute intervals.
3	1027	$I_O = 3.0$ A; T_A = room ambient as defined in the general requirements of MIL-STD-750 (see 4.5); $f = 50$ -60 Hz, at V_{RWM} (see 1.3); $T_L \leq +55^\circ\text{C}$, lead length = 9.52 mm (.375 inch).

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be in accordance with table I, group A, subgroup 2 herein.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
2	2036	Tension: Test condition A; weight = 20 pounds; $t = 15$ s. Lead fatigue: Test condition E; weight 1 pounds. NOTE: Both tension and lead fatigue are not applicable for US devices.
6	1026	$I_O = 3.0$ A; T_A = room ambient as defined in the general requirements of MIL-STD-750 (see 4.5); $f = 50$ -60 Hz, at V_{RWM} (see 1.3). $T_L \leq +55^\circ\text{C}$, lead length = 9.52 mm (.375 inch).

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with MIL-PRF-19500 and the conditions for subgroup testing in table II herein. Electrical measurements (end-points) shall be in accordance with table I, group A, subgroup 2 herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

4.5.2 Steady-state operation life. This test shall be conducted with a half-sine wave of the specified peak voltage impressed across the diode in the reverse direction followed by a half-sine waveform of the specified average rectified current. The forward conduction angle of the rectified current shall not be greater than 180° nor less than 150° .

4.5.3 Thermal impedance. Thermal impedance $Z_{\theta JX}$ measurements shall be performed in accordance with MIL-STD-750, method 3101 to identify and remove atypical devices. Read and record data ($Z_{\theta JX}$) shall be supplied to the qualifying activity on one lot (random sample of 500 devices minimum) prior to shipment. Twenty-two samples shall be serialized and provided to the qualifying activity for test correlation. The maximum upper control limit for $Z_{\theta JX}$ in screening (table IV of MIL-PRF-19500) shall be derived by each vendor by means of statistical techniques. When three successive sealing lots have exhibited control, the data from these three lots will be used to establish a fixed screening limit, (not to exceed the group A, subgroup 2 limit). Once a fixed limit has been established, monitor all future sealing lots using a three-piece sample from each production lot to be plotted on the applicable X, R chart.

4.5.3.1 For initial qualification and requalification Read and record data ($Z_{\theta JX}$) shall be supplied to the qualifying activity on one lot (random sample of 500 devices minimum) prior to shipment. Twenty-two samples shall be specialized and provided to the qualifying activity for test correlation.

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TABLE I. Group A inspection.

Inspection 1/ Method	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance	3101	See 4.5.3	Z _{θJX}		3.0	°C/W
Forward voltage	4011	I _{FM} = 1.0 A (pk) pulsed (see 4.5.1)	V _{FM1}		0.76 0.83	V dc V dc
1N6826, 1N6826US 1N6831, 1N6831US						
Forward voltage	4011	I _{FM} = 3.0 A (pk) pulsed (see 4.5.1)	V _{FM2}		0.84 0.92	V dc V dc
1N6826, 1N6826US 1N6831, 1N6831US						
Reverse current leakage	4016	Pulse method	I _{RM1}		5.0 3.0	μA μA
1N6826, 1N6826US 1N6831, 1N6831US		V _{RM} = 100 V (pk) V _{RM} = 200 V (pk)				
<u>Subgroup 3</u>						
High temperature operation:		T _A = +125°C				
Reverse current leakage	4016	Pulse method (see 4.5.1)	I _{RM2}		0.25 0.20	mA dc mA dc
1N6826, 1N6826US 1N6831, 1N6831US		V _{RM} = 100 V (pk) V _{RM} = 200 V (pk)				
Forward voltage	4011	Pulse method (see 4.5.1) I _F = 3.0 A (pk)	V _{FM3}		0.68 0.76	V dc V dc
1N6826, 1N6826US 1N6831, 1N6831US						
Low temperature operation:		T _A = -55°C				
Reverse current leakage	4016	Pulse method (see 4.5.1)	I _{RM3}		0.1 0.1	mA dc mA dc
1N6826, 1N6826US 1N6831, 1N6831US		V _{RM} = 100 V (pk) V _{RM} = 200 V (pk)				
Forward voltage	4011	Pulse method (see 4.5.1) I _F = 3.0 A (pk)	V _{FM4}		0.98 1.06	V dc V dc
1N6826, 1N6826US 1N6831, 1N6831US						
<u>Subgroup 4</u>						
Capacitance	4001	V _R = 5 V dc, .01 ≤ f ≤ 1 MHz, V _{SIG} = 50 mV p-p	C _T		100 60	pF pF
1N6826, 1N6826US 1N6831, 1N6831US						

1/ For sampling plan, see MIL-PRF-19500.

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TABLE II. Group E inspection (all quality levels) for qualification only. 1/

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			22 devices c = 0
Thermal shock (temperature cycling)	1051	500 cycles. Test condition C.	
Hermetic seal	1071	Test condition E	
Electrical measurement		See table I, group A, subgroup 2	
<u>Subgroup 2</u>			22 devices c = 0
Steady-state reverse bias	1038	Test condition A; 1,000 hours, See 4.3, screen 10	
Electrical measurement		See table I, group A, subgroup 2	
<u>Subgroup 3</u>			
Not applicable			
<u>Subgroup 4</u>			
Thermal resistance, (forward voltage drop diode method)	4081 or 3101	$R_{\theta JL} = 30^{\circ}\text{C/W}$ maximum at 9.52 mm (.375 inch) lead length; $R_{\theta JEC} = 10^{\circ}\text{C/W}$ maximum; method 3101 in accordance with 4.5.3 except $I_H = 3\text{ A}$ and $T_H = 20\text{ s}$ (minimum); $T_A = +25^{\circ}\text{C}$.	5 devices c = 0
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 6</u>	1020		3 devices
ESD			

1/ For initial design and process change verification only (one time testing).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Issue of DODISS to be cited in the solicitation and, if required, the specific issue of individual documents referenced (see 2.2.1).
- b. Lead finish (see 3.4.2).
- c. Type designation and product assurance level.
- d. Packaging requirements (see 5.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers' List (QML) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, ATTN: DSCC-VQE, 3990 East Broad Street, Columbus, OH 43216-5000..

6.4 Suppliers of JANHC die. The qualified JANHC and JANKC suppliers with the applicable letter version (example JANHCA1N6826) will be identified on the QML.

JANC ordering information	
PIN	Manufacturer
	13409
1N6826	JANHCA1N6826 JANKCA1N6826
1N6831	JANHCA1N6831 JANKCA1N6831

Custodians:
Army - CR
Navy - EC
Air Force - 11
NASA - NA

Preparing activity:
DLA - CC
(Project 5961-2211)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-19500/670	2. DOCUMENT DATE 19 June 2000
3. DOCUMENT TITLE SEMICONDUCTOR DEVICE, HERMETIC, DIODE, SILICON, RECTIFIER, SCHOTTKY BARRIER, TYPES 1N6826, 1N6826US, 1N6831 and 1N6831US JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) COMMERCIAL DSN FAX EMAIL	7. DATE SUBMITTED
8. PREPARING ACTIVITY		
a. Point of Contact Alan Barone	b. TELEPHONE Commercial DSN FAX EMAIL 614-692-0510 850-0510 614-692-6939 alan_barone@dsccl.dla.mil	
c. ADDRESS Defense Supply Center Columbus, ATTN: DSCC-VAC P.O. Box 3990 Street, Columbus, OH 43213-1199	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533, Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888	